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Mohit Agarwala

Education

Year	Degree	Institute	GPA(10)/Marks(%)
2022	M.Tech in Communication & Signal Processing	IIT Bombay	8.68
2018	B.Tech in Electronics & Communication	Heritage Institute of Technology, Kolkata	7.85
2014	Senior School	DAV Public School, Midnapur	86.80%
2012	High School	Splendour High School, Kharagpur	89.28%

Areas of Interest

Machine Learning, Optimization, Data Science, Deep Learning in Image & Speech Processing

Research Experience

Jan 2022–Ongoing **Dailizing & clustering of Non-daily Trains using Machine Learning**, Indian Railways.
Developed algorithm for optimized weekly scheduling of trains in GQD network using unsupervised methods
- Resolved train reversals and misdirection classifications from the SATSANG data
- Clustering & visualization of trains in GQD using representation learning methods e.g, t-SNE, PCA
- Identified under-utilized paths for further processing to increase throughput of the Indian Railway Network

Jul 2020–Aug 2021 **Geolife Trajectory & Google Cluster Data Analysis for Content Caching**, Stochastic Systems Lab, Graduate Research Assistant, IIT Bombay.
- Proposed a Dynamic Policy, α-Retro Renting, and provided its performance guarantees at the Edge Server
- Developed tools for pre-processing and map simulation from 180+ GPS Taxi Data of Beijing City
- Implemented K-means clustering using Voronoi tessellation to the original city map
- Found several regimes where α-RR greatly improves cost-efficiency and, in the worst case, it is 6-optimal

Jun 2021–Ongoing **On Latency & QoS in Haptics Simulation using Video Streaming over Wi-Fi**, Master's Thesis.
- Studied Operator/Tele-Operator-Based Haptics application to perform low latency tasks in a wired medium
- Built a reliable UDP Protocol for Multi-media applications in C++/Python from scratch
- Measured one-way latency & implemented packet marking in a congested environment for priority access

Key ML Projects

Aug 2020–Dec 2020 **Facial Emotion Recognition using Deep Learning**, *Prof. Preethi Jyothi, CSE Dept., IIT Bombay.*
- Used FER-13 dataset which comprises a total of 35887 pre-cropped, 48-by-48-pixel grayscale images
- Trained various CNN models like VGG-16, Inception, AlexNet and studied evolution of their performance
- Deployed our best model, VGG-16, with 5 emotions for real-time prediction using openCV cascade classifier

Jan 2021–Apr 2021 **Speech to Sign-Language for the Hearing-Impaired**, *Prof. Preethi Jyothi, CSE Dept., IIT Bombay.*
- Trained Convolutional Neural Network on RAVDESS audio samples to detect emotion from speech
- Used a Conformer-based pre-trained model from ESPNET-model zoo, for Speech2Text conversion
- Created a streamlit based UI to record audio and display the corresponding predicted text and emotion

Aug 2020–Dec 2020 **Employee Attrition Classification**, *Prof. Amit Sethi, EE Dept., IIT Bombay.*
- Objective : To predict whether an employee will leave the company or not based on 33 information points
- Extracted relevant and less correlated features and applied One-Hot Encoding for multi-classes features
- Achieved an accuracy of 88.47% by training SVM (Support vector machine) classifier on IBM HR dataset

Jan 2021–
Apr 2021
Speech Recognition using End-to-End ASR, *Prof. Preethi Jyothi, CSE Dept., IIT Bombay.*
- Designed an LSTM-based Recurrent Neural Network using MFCC features as inputs at each timeframe
- Used a Language Model(LM) with beam search decoding to avoid misspelled words in predictions
- Used Softmax output layer that gives a probability distribution over characters for each timeframe

Aug 2020–
Dec 2020
Predicting Release Year of Songs, *Prof. Preethi Jyothi, CSE Dept., IIT Bombay.*
- Objective : Predict the release year of a song from a set of timbre-based audio features extracted from it
- Implemented a Feed-Forward Neural Network for regression task using NumPy from scratch
- Performed different data pre-processing steps like feature scaling, selection etc. to improve overall accuracy
- Limited RMSE to 11.15 by performing Mini-Batch GD & using ADAM Optimizer on MSD Dataset

Aug 2020–
Dec 2020
Digital Photography Flash No-Flash Image Pairs, *Prof. Suyash Awate, CSE Dept., IIT Bombay.*
- Implemented denoising and detail transfer to merge the ambient qualities of the no-flash image with the high-frequency flash detail, using cross-bilateral filtering
- Performed white-balancing to change the color tone of ambient images, continuous flash to adjust flash intensity interactively, and red-eye removal to repair artifacts in the flash image

Conference Publications

Icccn '21 V. S. C. L. Narayana, **M. Agarwala**, N. Karamchandani and S. Moharir, "Online Partial Service Hosting at the Edge," 2021 International Conference on Computer Communications and Networks (ICCCN), 2021, pp. 1-9, doi: 10.1109/ICCCN52240.2021.9522218.

Tompecs '22 V. S. C. L. Narayana, **M. Agarwala**, N. Karamchandani and S. Moharir, "On Renting Edge Resources for Partial Service Hosting", Journal Preprint.

Relevant Courses

Completed Foundations of Machine Learning, Automatic Speech Recognition, DSP & its Applications, Statistical Signal Analysis, Digital Image Processing, Optimization, Communication Networks, Real Analysis

Ongoing Deep Learning in Natural Language Processing, AI Data & Policy

Technical Skills

Languages Python, C/C++, Matlab/GNU Octave

Frameworks Keras, PyTorch, Tensorflow, Pandas, MatplotLib, NumPy, Scikit-learn

Utilities Anaconda, Git, Vim, LaTeX, Jupyter Notebook | Operating system : Linux, Windows

Positions of Responsibility

Mar 2020–
Jun 2020
SHALA, *Stay Home & Learn AI*, Teaching Assistant.
Part of a team of academics, industry experts, and students working in data science, machine learning, and deep learning to teach a course on these topics to interested students for free during the pandemic

Nov 2019–
Dec 2019
Institute Interview Coordinator, IPT, IIT Bombay.
Coordinated with a team of 250+ members for interviews of 1600+ students. Assisted in conducting Pre-placement Talks and Tests for 15+ firms

Aug 2019–
Apr 2020
Mess Councillor, Hostel Council Team, IIT Bombay.
Supervised, coordinated & managed the planning & execution of food needs for 600+ hostel students. With the zero-waste management system, we were able to provide high-quality meals at a low cost. Organized & participated in various cultural, technical, and sports events for Hostel-4 IIT Bombay

Miscellaneous

- Secured 98.86 percentile in GATE-19(Electronics & Communication Engineering) among 104782 candidates
- Awarded Hostel Organization Special Mention for exemplary contribution to Hostel-4 throughout the year
- Won Gem of the General Championship (MDGC-2019) Hostel-4, IIT Bombay, as part of the Dramatics team
- Completed a short course on "State of the Art Microcontroller" organized by Dept. of CSE, IIT Kharagpur
- Participated in short course on "Python for 5G MU, Massive MIMO, and mmWave MIMO" by IIT Kanpur
- **Interests and Hobbies**: Cricket, Badminton, Table tennis, Listening to music